Snow bank: Study finds Montana holds snow longer

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Misty Inglet March 8, 2021

The Last Best Place could have the last best snow.

New climate research from the Scripps Oceanography Institute may explain why Montana might keep its winter white while the North Cascades in Washington melt out sooner than usual. The “shrinking winter” phenomenon seen along the coastal United States and southern Rocky Mountains could also lead to longer wildfire seasons in places like California and Arizona.

"Global warming isn't affecting everywhere the same,” said Amato Evan, lead author of the study, which was published March 1 in the journal Nature Climate Change. “As you get closer to the ocean or further south in the U.S., the snowpack is more vulnerable, or more at-risk, due to increasing temperature, whereas in the interior of the continent, the snowpack seems much more impervious, or resilient to rising temperatures."

So while ski hills like Snowbowl and Lookout Pass continue to pack their runs, other parts of California are seeing early melts.

An analysis of four decades of snowpack observations across the western United States revealed a distinct split where some regions experienced a rapid change in melt-out while others have remained more consistent. The mountains of the Sierra Nevada, North Cascades and southern Arizona ranked among the most vulnerable to quick melting. The northern Rocky Mountains of Montana, Idaho, Wyoming and Utah held their snow longer.

Evan and co-author Ian Eisenman theorize increasing global temperatures affect coastal and southern areas more extensively than places in the interior of the continent, even though they experience the warming too. The same early-spring phenomena happens in the Alps of Europe, southern regions of South America and the Arctic, while long-lasting snow remains in Central Europe and the interiors of Russia and China.

The study combed through records from almost 400 SNOTEL sites managed by the Natural Resources Conservation Service between 1982 and 2018. Then it overlaid air temperature data from the North American Regional Reanalysis. Evan and Eisenman developed a formula that simulated the timing of snow accumulation and melting as a function of temperature.

They found that places with big swings between summer and winter temperatures (such as the northern Rockies) felt less impact from global warming than places where the winter-summer shift is smaller. Having a higher average annual temperature also hurt chances of holding snowpack longer.

The study found that places where the average winter temperature stays at or below 0 C (32 Fahrenheit), such as the northern Rockies, showed little reaction if the average went up 1 degree. Spring runoff started a couple days earlier.

But in the North Cascades, that 1 degree shift could trigger snow melt a month earlier than in the past. The reason appears to be that longer times above freezing gives snowpack shorter windows of accumulation.

The results could be longer fire seasons in places like California and Oregon, according to Evan and Eisenman. California foresters also report increasing incidents of bark beetle infestations that may be linked to the “shrinking winter” phenomenon.

"Our theory tells us why that's happening, and it's basically showing that spring is coming a lot earlier in the year if you're in Oregon, California, Washington, and down south,” Evan said, “but not if you're in Colorado or Utah."

Montana’s local snowmelt records appear to bear out that trend, according to National Weather Service hydrologist Ray Nickless. While there have been some April peak runoff years, the Clark Fork River drainage around Missoula has consistently seen its biggest surge in late May or early June.

“There are some studies indicating the melt is coming out sooner,” Nickless said. “But if you look at the actual sites that record it, and river gauges really tell the story, there’s not that dramatic a change in the total melt even with the general trend to warming.”

That doesn’t mean winter is getting any easier. Travis Craft at the West-Central Montana Avalanche Center said events like last week’s warm days, freezing nights and big snow dumps led to “high” avalanche danger in many of the favorite backcountry travel areas around Missoula.

“This season in general has been one of the most deadly since 1926,” Craft said on Monday. “As of yesterday, in the U.S. we’ve had 33 avalanche fatalities, and that number needs to be double-checked.”

That alert has been reduced to “moderate” danger as of Monday. A cold front moving into the western Montana zone should keep snow showering through Tuesday, but daytime temperatures are forecast to remain above freezing. Early next week, the forecast is split between possibilities for another strong cold front bringing spring snow to the valley bottoms, or a warmer and milder spring shift.

As of Monday, the NOAA SNOTEL sites reported generally normal news throughout western Montana, with every region within 90% of normal snowpack except for most of Lincoln County (88%) and the Madison River basin (88%). The Bitterroot Basin had the best coverage with 110% while Missoula’s vicinity reported 105%.